

What we claim is

1. Process for the production of a clamping means for clamping a component (20;100) having contact surfaces (54) in a holder (16;102), comprising the process steps:

5 (a) production of a recess (58;104) in the holder (16;102),

10 (b) production of clamping means (42,60,72,88;106,112,114,118,120,122,124), which contain one or more spring-action clamping elements (72;112,120), have first and second contact surfaces (62 and 76) and are of such a dimension that when the component (20;100) to be clamped is in the clamped or closed position, the clamping means (42,60,72,88;106,112,114,118,120,122,124) are clamped and the first contact surfaces (62) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) adjoin the wall (70) of the recess (58;104) and the second contact surfaces (76) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) adjoin the contact surfaces (54) of the component (20;100) to be clamped,

15 (c) insertion of the clamping means (42,60,72,88;106,112,114,118,120,122,124) into the recess (58;104) of the holder (16;102) in a position in which the first contact surfaces (62) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) adjoin the wall (70) of the recess (58;104) and the clamping means (42,60,72,88;106,112,114,118,120,122,124) are pre-tensioned to a specific degree,

20 (d) finishing of the second contact surfaces (76) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) in this position, so that the shape of the second contact surfaces (76) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) is complementary to the shape of the contact surfaces (54) of the component (20;100) to be clamped.

25 2. Process for the production of a moulding tool for the production of precision articles, especially contact lenses, whereby the moulding tool has

- two tool halves (10,12), each tool half (10,12) containing a tool holder (16 and 18; 102) into each of which is clamped one tool insert (20 and 22; 100) of at least one pair of shape-determining tool inserts (20,22; 100) having contact surfaces (54), and
- 5 - positioning means (32,26,46,48), by means of which the tool holders (16,18; 102) when the moulding tool is closed are positioned relative to one another in such a way that each of a pair of shape-determining tool inserts (20,22;100) is opposite the other and interacts with the other to form a mould cavity,

10 with the process steps:

- (a) production of a number, corresponding to the number of pairs of shape-determining tool inserts (20,22;100), of continuous recesses (58; 104) which are aligned in pairs when the moulding tool is closed, in each of the tool holders (16,18; 102),
- (b) production of clamping means (42,60,72,88;106,112,114,118,120,122,124), which are associated with one of the recesses (58; 104) in the tool holders (16,18;102) and with one of the tool inserts (20,22;100), which contain one or more spring-action clamping elements (72;112,120), have first and second contact surfaces (62 and 76) and are of such a dimension that when the tool insert (20,22;100) to be clamped is in the clamped position, the clamping means (42,60,72,88;106,112,114, 118,120,122,124) are clamped and the first contact surfaces (62) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) adjoin the wall (70) of the recess (58;104) and the second contact surfaces (76) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) adjoin the tool insert (20,22;100),
- (c) insertion of the clamping means (42,60,72,88;106,112,114,118,120,122,124) into the recesses (58;104) of the tool holder (16,18;102) in a position in which the first contact surfaces (62) of the clamping means (42,60,72,88;106,112,114,118, 120,122,124) adjoin the wall (70) of the recess (58;104) and the spring-action clamping element(s) (72;112,120) are pre-tensioned to a specific degree,

(d) closing the moulding tool,

(e) finishing of the second contact surfaces (76) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) in this position, so that

5 (e₁) the shape of the second contact surfaces (76) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) is complementary to the shape of the contact surfaces (54) of the tool inserts (20,22;100) to be clamped, and

10 (e₂) the second contact surfaces (76) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) inserted in two aligned recesses (58;104) of the tool holders (16,18;102) are in alignment with one another.

15 3. Process according to claim 1 or 2, characterised by inserting a washer (94) between the clamping means (42,60,72,88;106,112,114,118,120,122,124), by means of which the spring-action clamping element(s) (72;112,120) is or are under the defined initial tension when the clamping means (42,60,72,88;106,112,114,118,120,122,124) are inserted in the recesses (59;104) of the tool holders (16,18;104).

20 4. Process according to one of claims 1 to 3, characterised in that the second contact surfaces (76) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) are finished by grinding.

25 5. Process according to one of claims 2 to 4, characterised in that the second contact surfaces (76) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) inserted in two aligned recesses (58;104) of the tool holders (16,18,102) are finished together.

30 6. Clamping means for clamping a component (20;100) having contact surfaces (54) in a holder (16;102), characterised by

(a) a recess (58;104) in the holder (16;102), and

5 (b) clamping means (42,60,72,88;106,112,114,118,120,122,124), which contain one or more spring-action clamping elements (72;112,120), have first and second contact surfaces (62 and 76) and are of such a dimension that when the component

10 (20;100) to be clamped is in the clamped position, the clamping means (42,60,72,88;106,112,114,118,120,122,124) are clamped and the first contact surfaces (62) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) adjoin the wall (70) of the recess (58;104) and the second contact surfaces (76) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) adjoin the contact surfaces (54) of the component (20;100) to be clamped, whereby

15 (c) the shape of the second contact surfaces (76) of the clamping means (42,60,72,88; 106,112,114,118,120,122,124) is complementary to the shape of the contact surfaces (54) of the component (20;100) to be clamped, and

20 (d) the clamping means is produced by the process according to any one of claims 1, 3 and 4.

25 7. Moulding tool for the manufacture of precision articles, especially contact lenses, characterised by

(a) two tool halves (10,12), each tool half (10,12) containing a tool holder (16 and 18; 102) into each of which is clamped one tool insert (20 and 22; 100) of at least one pair of shape-determining tool inserts (20,22; 100) having contact surfaces (54),

30 (b) positioning means (32,26,46,48), by means of which the tool holders (16,18; 102) when the moulding tool is closed are positioned relative to one another in such a way that each of a pair of shape-determining tool inserts (20,22;100) is opposite the other and interacts with the other to form a mould cavity,

10 (c) a number, corresponding to the number of pairs of shape-determining tool inserts (20,22;100), of continuous recesses (58; 104) which are aligned in pairs when the moulding tool is closed, in each of the tool holders (16,18; 102) and

15 (d) clamping means (42,60,72,88;106,112,114,118,120,122,124), which are associated with one of the recesses (58; 104) in the tool holders (16,18;102) and with one of the tool inserts (20,22;100), which contain one or more spring-action clamping elements (72;112,120), which have first and second contact surfaces (62 and 76) and are of such a dimension that when the tool insert (20,22;100) to be clamped is in the clamped position, the clamping means (42,60,72,88;106,112,114,118,120,122,124) are clamped and the first contact surfaces (62) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) adjoin the wall (70) of the recess (58;104) and the second contact surfaces (76) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) adjoin the tool insert (20,22;100), whereby

20 (e) the shape of the second contact surfaces (76) of the the clamping means (42,60,72,88;106,112,114,118,120,122,124) is complementary to the shape of the contact surfaces (54) of the tool inserts (20,22;100) to be clamped,

25 (f) the second contact surfaces (76) of the clamping means (42,60,72,88;106,112,114,118,120,122,124) inserted in two aligned recesses (58;104) of the tool holders (16,18;102) are in alignment with one another, and

8. Clamping means or moulding tool according to claim 6 or 7, whereby the contact surfaces (54) of the component (20;100) to be clamped or of the tool inserts (20,22;100) to be clamped are formed by a cylindrical outer face (54) and the second contact surfaces (76) of the clamping means (42,60,72,88;106, 112,114,118,120,122,124) are formed by one or more annular or cylindrical inner faces (76) which are complementary to the cylindrical outer face (54).

9. Clamping means or moulding tool according to one of claims 6 to 8, whereby the clamping means (42,60,72,88;106, 112,114,118,120,122,124) contain one or more tightening discs (112,120).

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10. Clamping means or moulding tool according to claim 9, whereby two or more tightening discs (112) are arranged directly next to one another.

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11. Clamping means or moulding tool according to claim 9 or 10, whereby the tightening discs (112,120) are arranged at several levels at fixed distances from one another.

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12. Clamping means or moulding tool according to one of claims 6 to 11, whereby

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(a) the clamping means (42,60,72,88;106, 112,114,118,120,122,124) contain a centring sleeve (60) and a clamping sleeve (72) which is slidable inside the centring sleeve (60),

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(b) the outer face (62) of the centring sleeve (60) adjoins the wall (70) of the recess (58),

(c) the centring sleeve (60) has a conical inner face (64), and

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(d) the clamping sleeve (72) has a conical outer face (74) which is complementary to the conical inner face (64) of the centring sleeve (60), whereby

(e) when the clamping sleeve (72) is clamped, it is pushed into the centring sleeve (60), so that the conical outer face (74) of the clamping sleeve (72) adjoins the conical inner face (64) of the centring sleeve (60).

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13. Clamping means or moulding tool according to one of claims 6 to 12, whereby the clamping means (42,60,72,88;106, 112,114,118,120,122,124) have actuating means (42;88;118,122,124) to actuate the spring-action clamping element(s) (72;112,120).

14. Moulding tool according to one of claims 7 to 13, whereby the clamping means (42,60,72,88) contain an actuating element (42), by means of which the spring-action clamping element(s) (72) of all the clamping means (42,60,72,88) associated with a tool holder (16) are actuated simultaneously.